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Distributed Energy Resources For Federal Facilities Using Industrial Gas Turbine Generators

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Serving Power Generation Applications from 1-50 MW

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Broad Applications Experience in CHP

Application	No. of Units
Airports	8
Ceramic Manufacturing	57
Chemical / Petrochemical	122
Pharmaceuticals	24
Communications	2
District Heating	125
Food Processing	17
Government-Owned Power Generation	43
Hospitals	4
Hotels	8
Independent Power Producers (IPPs)	29
Investor-Owned Utilities	29
Landfill / Waste Treatment	62
Manufacturing	26
Mining	87
Municipals/Rurals/Cooperatives	180
Pulp and Paper	54
Textiles	11
Tires and Rubber	58
University / Research Facilities	39
Other Commercial	191
Other Industrial	484
Oil and Gas Applications	—
Total	1577

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Advantages of Integrated Energy Systems

- Improves Reliability of Power and Steam/Chilled Water Supply
  - Grid or other standby generators for backup
- Large Cost Savings
  - Typical Payback Period is 3 - 6 Years
- High efficiency
- Reduces Global Emissions
- Eliminates Grid Congestion
- Improves Fuel Utilization

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Disadvantages of Integrated Energy Systems

- High Capital Cost
- Requires Consistent Fuel Supply
- Need Alternative Power Supply for 100% Reliability
- Economics Depend on Spark Spread Ratio
- Committed Capital Cost

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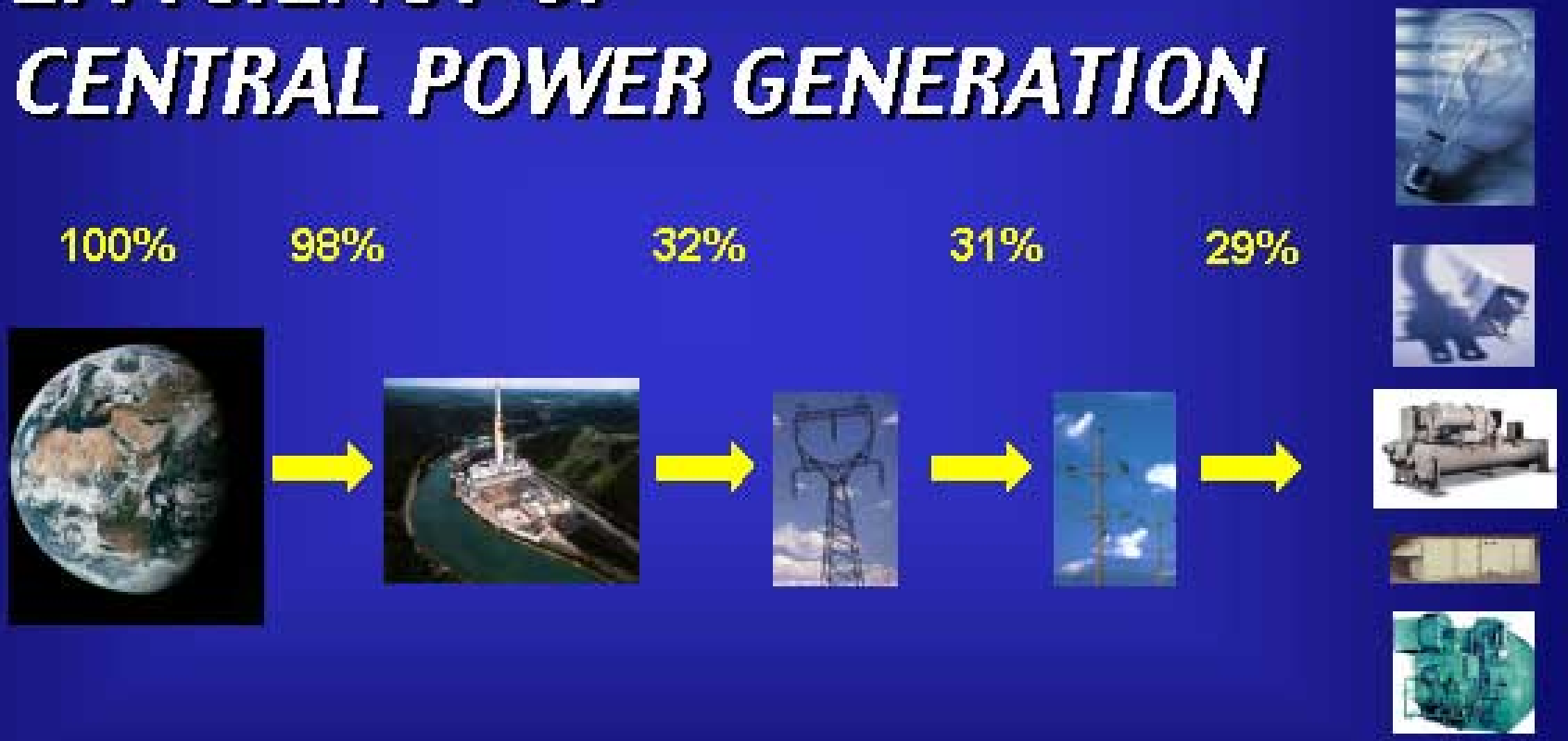
Efficiency Comparison - Central Power Plant

EFFICIENCY OF CENTRAL POWER GENERATION



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Efficiency Comparison - Combined Cycle Power Plant

EFFICIENCY OF POWER DISTRIBUTED COMBINED CYCLE

100% 91% 50% 48%

NATURAL RESOURCE

COMBINED CYCLE POWER PLANT

DISTRIBUTION

END USES

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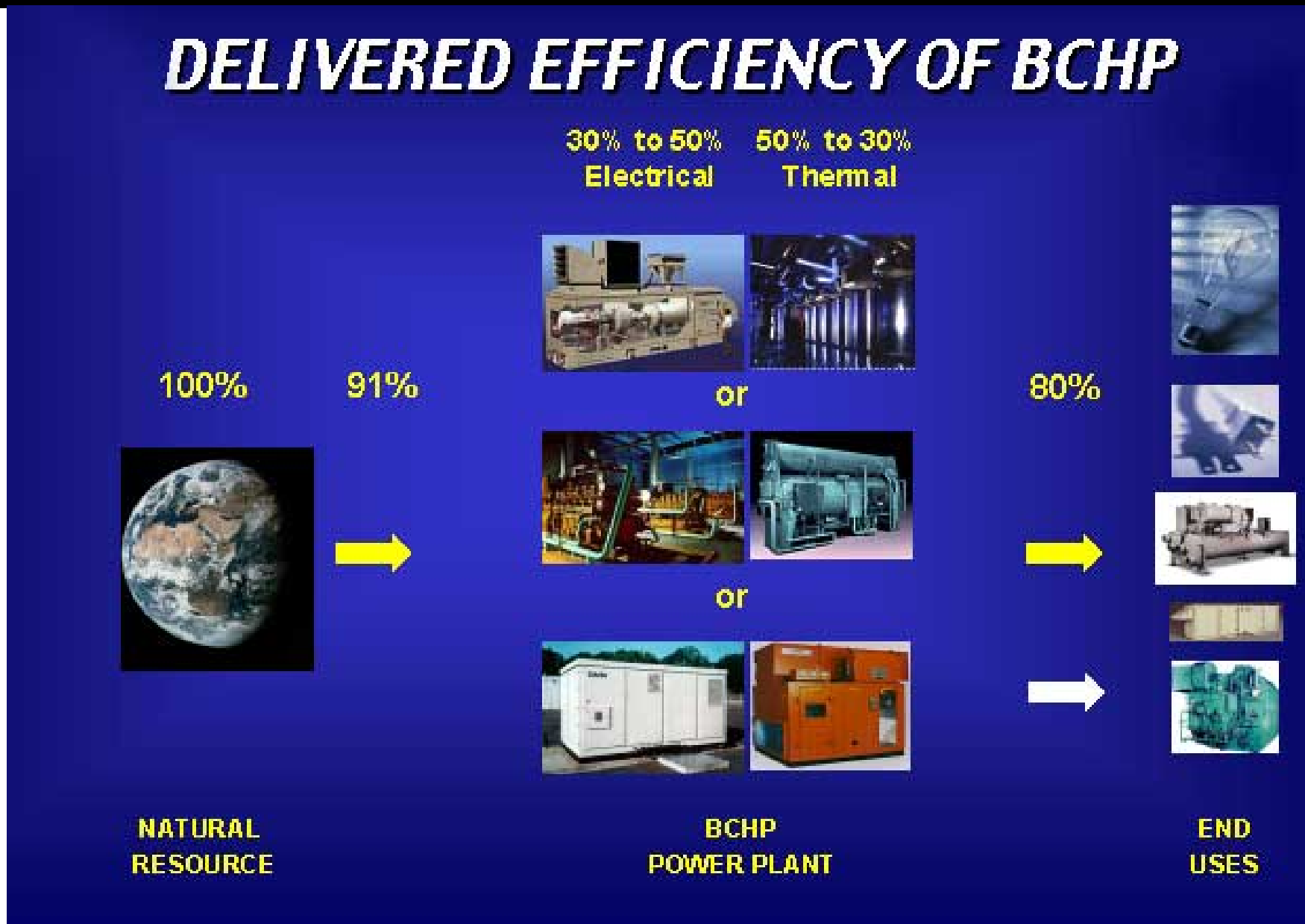
Efficiency Comparison - BCHP System



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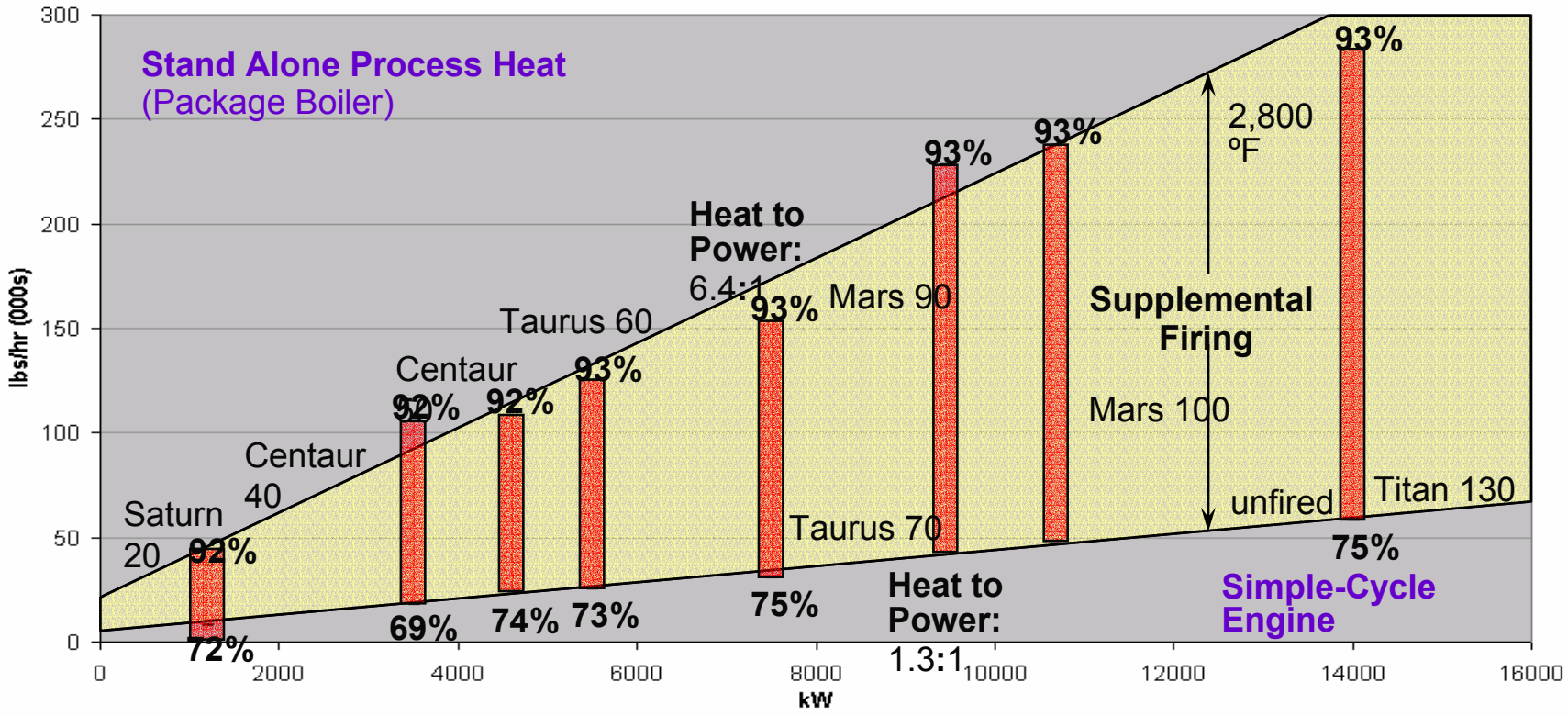
Heat to Power Ratios for CT CHP Applications



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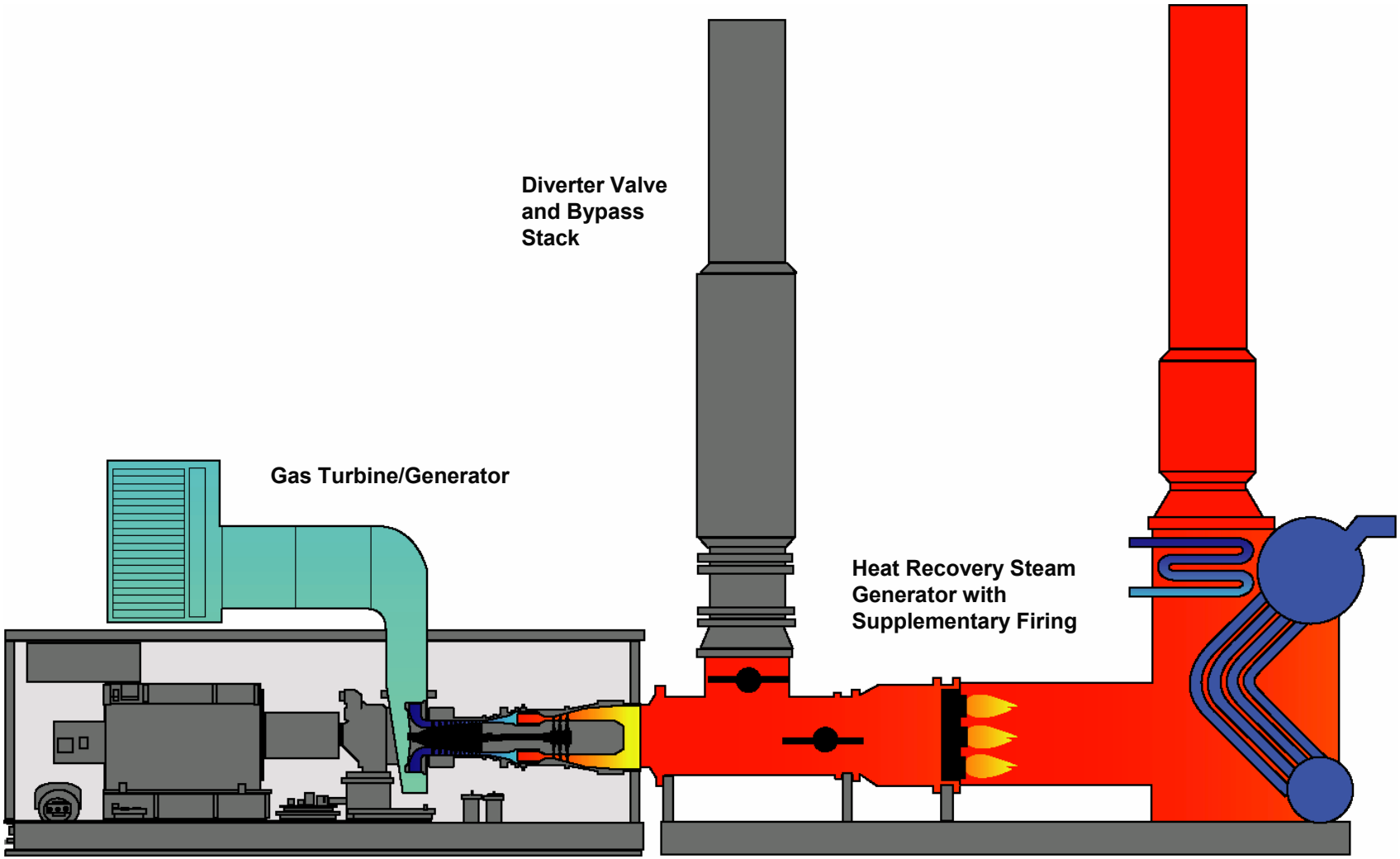
Typical CHP System



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CHP System Performance

Product	Power, MWE	Exhaust Energy, MMBtu/hr	Steam Flow Unfired		Steam Flow Duct Fired to 1700oF	
			Lb (000)/hr	Eff, %	Lb (000)/hr	Eff, %
Saturn 20	1.2	11.7	8.8	72	19.7	85
Centaur 40	3.4	28.7	18.8	69	56.1	84
Centaur 50	4.4	34.4	24.0	74	57.4	85
Taurus 60	5.4	38.7	30.0	73	67.8	87
Taurus 70	7.4	47.4	32.3	75	81.9	87
Mars 100	10.4	71.8	48.6	75	125.8	87
Titan 130	13.7	86.4	62.7	79	150.4	87

ISO Conditions: 59°F; 3 In. Inlet, 7 In. Exhaust Losses;
Sea Level; Saturated Steam @ 150 psig

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Typical CHP Installations

Taurus 60 with Hi Fired HRSG for a University

Centaur 40 with HRSG and SCR in Irvine for a Manufacturing Plant

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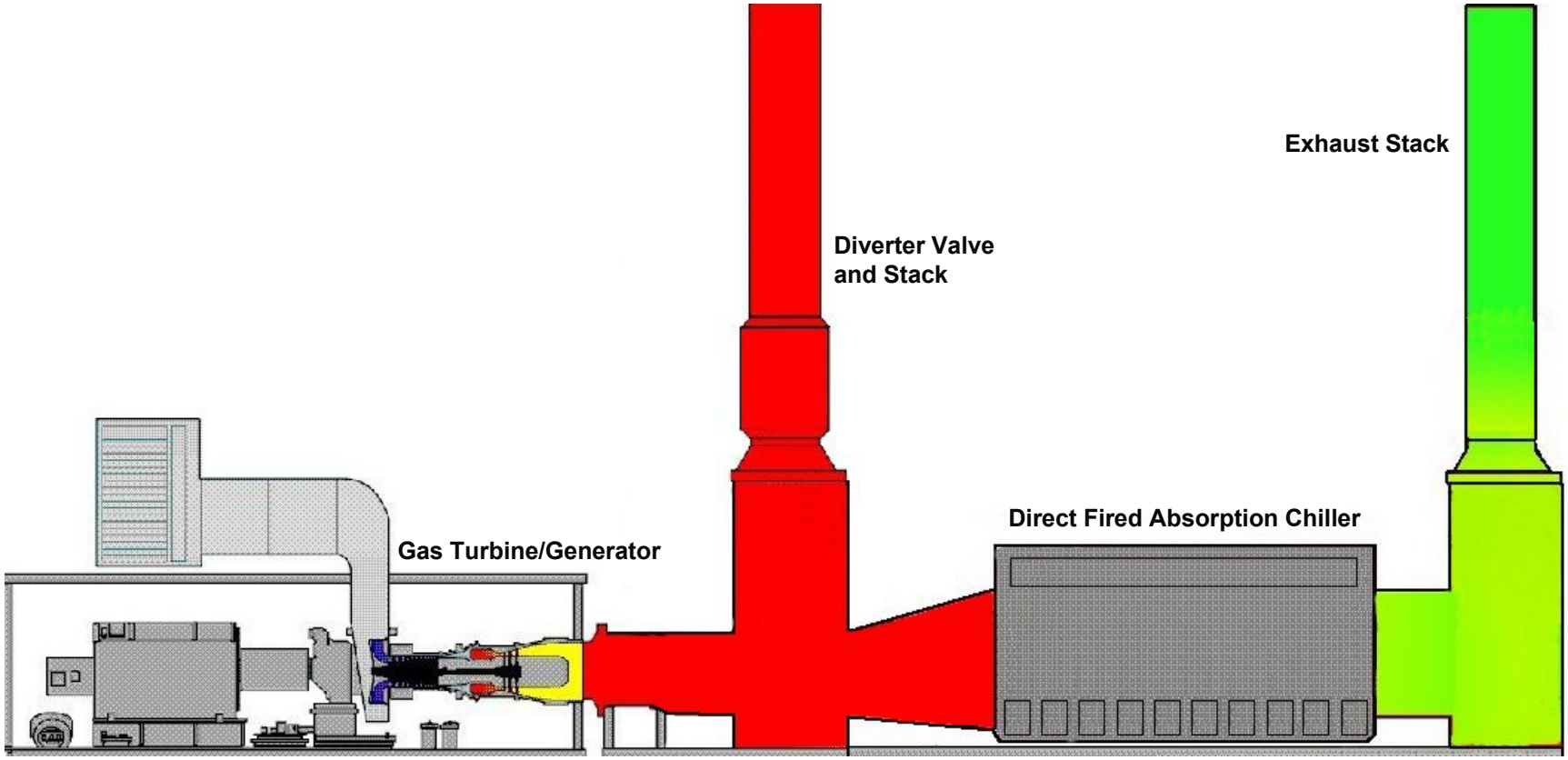
Typical Building Heating, Cooling and Power Plant

Useful Outputs: Electrical Power, Chilled Water & Hot Water



Sound level of system - < 85 dBA at 1 meter

Example Package Footprint:
Saturn BCHP - 10’ x 60’
Centaur 40 BCHP - 10’ x 70’

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BCHP Capabilities

Engine Family	KW Output	Chilling, Tons	Heating, MMBTU/hr
Saturn 20	1200	855	7.4
Centaur 40	3400	1900	16.1
Centaur 50	4600	2500	21.6
Taurus 60	5400	2900	24.9
Taurus 70	7500	3300	28.2

Data above at ISO conditions, 15°C, sea level
Assumes double effect absorption chillers
Exhaust fired chiller can produce hot water temperatures up to 93°C

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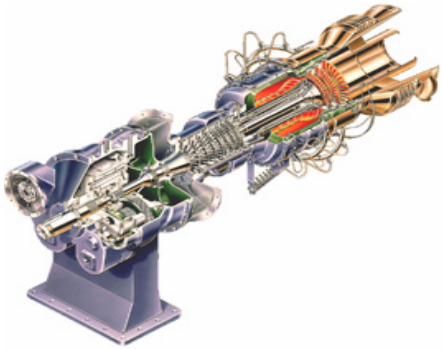
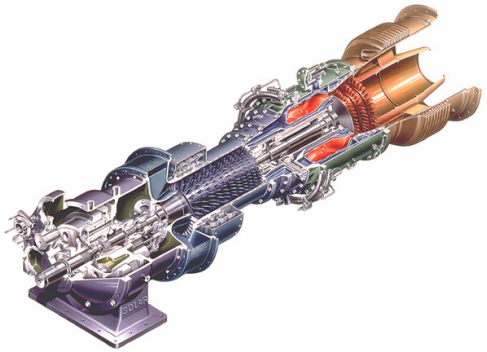
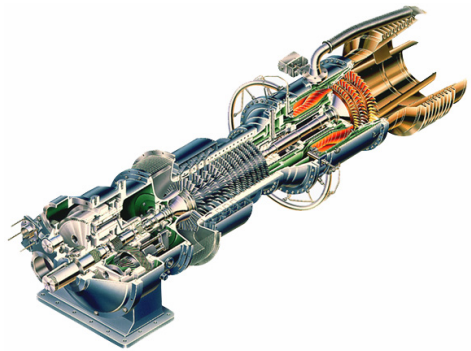
Solar's Power Gen Product Families



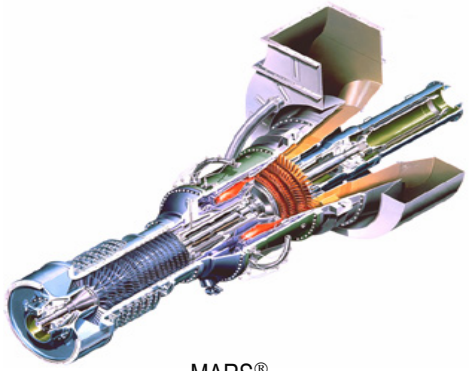
SATURN®	
Saturn 20	1 210 kWe



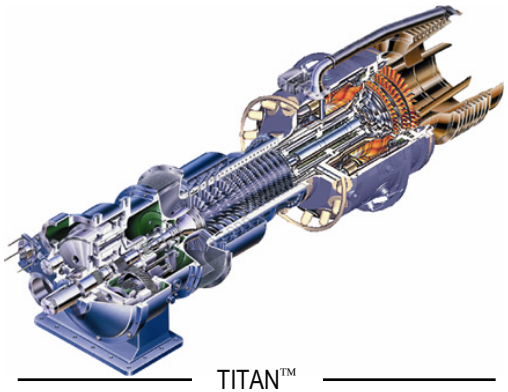
CENTAUR®	
Centaur 40	3 515 kWe
Centaur 50	4 600 kWe



TAURUS™	
Taurus 60	5 500 kWe
Taurus 70	7 500 kWe



MARS®	
Mars 90	9 285 kWe
Mars 100	10 695 kWe



TITAN™	
Titan 130	14 000 kWe

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Government / Military CHP Projects

Lackland AFB, San Antonio, TX	10 MW
General Services Administration, DC	10 MW
Groton Navy Yard, Groton, CT	5 MW
Valcartier AFB, Quebec City	3 MW
Portsmouth Navy Yard, Portsmouth, NH	5 MW
Balboa Naval Hospital, San Diego	3 MW
U.S. Coast Guard, Kodiak, AK	6 MW
National Animal Research Center, IA	1 MW
Avenal State Prison, Avenal, CA	7 MW
Hunterdon State Prison, Clinton, NJ	4 MW
Otay State Prison, San Diego	3 MW
Satellite Center, Sunnyvale, CA	12 MW
Wisconsin State Prison, Waupun, WI	1 MW
Twenty Nine Palms Marine Base, CA	7 MW
Social Security Administration, MD	42 MW
VA Hospital, North Chicago	5 MW
VA hospital, West Chicago	3 MW

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Balboa Naval Hospital, San Diego

Combined Heat and Power Plant

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Balboa Naval Hospital, San Diego

3x 1 MWe CT with HRSG

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Lackland AFB, San Antonio, Texas

10 MW Combined Heat and Power Plant

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Lackland AFB, San Antonio, Texas

10 MW Combined Heat and Power Plant

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General Services Administration
Washington, D.C.

10 MW Combined Heat and Power Plant

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Social Security Administration

42 MW Standby and Peaking Power Plant

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Social Security Administration

42 MW Standby and Peaking Power Plant

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5 MWe of Portable Power

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Further Information

www.solarturbines.com